SUBJECT CODE : MT/AC/MP23

B. Sc. DEGREE EXAMINATION, APRIL 2007
BRANCH III – PHYSICS
SECOND SEMESTER

COURSE   : **ALLIED CORE**
PAPER   : **MATHEMATICS FOR PHYSICS - II**
TIME   : **3 HOURS**   **MAX. MARKS : 100**

SECTION – A

ANSWER ALL QUESTIONS: **(10X2=20)**

1. Eliminate the arbitrary function from $z = f(x^2 + y^2)$.

2. Solve $x + y\dfrac{\partial z}{\partial x} = 0$.

3. Find the complete integral of $q = p^2$.

4. Find $L[\sin 3t + \sinh 3t]$

5. Find $L[te^{-5t}]$

6. Find $L^{-1}\left[\dfrac{1}{(s+2)^3}\right]$

7. State the formula for expanding a function as a Fourier series in the interval $[0, 2\pi]$.

8. Define conditional probability of an event and give the formula for finding it.

9. Show that $E^2 Y_x = Y_{x+2h}$.

10. If f(0) = 0, f(1) = 13, f(2) = 15, f(3) = 60, find $\nabla^3 f(3)$.

SECTION – B

ANSWER ANY FIVE QUESTIONS: **(5X8=40)**

11. Solve $p^2 z^2 + q^2 = 1$

12. Solve $p + q = px + qy$

13. Find the Laplace Transform of:
    a) $f(t) = e^{-t}$ when $0 < t < 4$
           $= 0$ when $t > 4$
    b) $\dfrac{e^{-3t} - e^{-2t}}{t}$

14. Obtain the inverse Laplace ttransform of
    a) $\dfrac{1}{(s+1)(s^2 + 2s + 2)}$ b) $\dfrac{s}{(s+3)^2 + 4}$

15. Find the sine series expansion of $y = \pi - x$ in the range 0 to π.

16. The probability of 3 students A, B, C solving a problem in statistics is $\frac{1}{2}, \frac{1}{3}$ and $\frac{1}{4}$ respectively. A problem in statistics is given to all the 3 students. What is the probability that,

   (1) No one will solve the problem.
   (2) Only one will solve the problem.
   (3) At least one will solve the problem ?

17. Estimate the production for 1974 and 1976 from the following data:

Year	1971	1972	1973	1974	1975	1976	1977
Production In 100 tons	200	220	260	-	350	-	430

SECTION – C

ANSWER ANY TWO QUESTIONS: **(2X20=40)**

18. a) Obtain the partial differential equation of all spheres whose centers lie on the z-axis.
   b) Solve: $z = px + qy + 2\sqrt{pq}$
   c) Solve: $x^2 p + y^2 q = (x + y)z$ (6+6+8)

19. a) Use Laplace transform to solve $\frac{d^2 y}{dx^2} - 3\frac{dy}{dx} + 2y = 4$ subject to $y = 2$, $\frac{dy}{dx} = 3$, when x = 0.
   b) There are 3 boxes containing respectively 1 white, 2 red, 3 black balls; 2 white, 3 red, 1 black ball; 3 white, 1 red, 2 black balls. A box is chosen at random and from it two balls are drawn at random. The two balls are 1 red and 1 white. What is the probability that they came from the first box ?   (12+8)

20. a) If $f(x) = -x$ in $-\pi < x < 0$
               $= x$ in $0 < x < \pi$.
   Expand $f(x)$ as a Fourier series in the interval $-\pi$ to π. Deduce that
   $$\frac{\pi^2}{8} = 1 + \frac{1}{3^2} + \frac{1}{5^2} + \ldots\ldots$$
   b) Using Lagrange's formula fit a polynomial to the given data

x	0	1	3	4
y	-12	0	6	12

                                        (12+8)

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